

In re: Litwinski
Appl. No.: 10/606,564
Filed: June 26, 2001
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Amendments to the Claims:

1. (currently amended) An apparatus for operating on a workpiece, comprising:
a die defining first and second apertures and an interior therebetween, said first aperture and said interior of said die being structured to receive the workpiece; and
at least one rotatable pin extending at least partially into said interior of said die, said at least one pin being structured to at least partially plasticize the workpiece through frictional heat ~~stir the workpiece~~ as the workpiece moves through said interior of said die to thereby refine the grain structure of the workpiece.
2. (original) An apparatus according to Claim 1 further comprising a ram structured to urge the workpiece through said interior of said die from said first aperture to said second aperture.
3. (original) An apparatus according to Claim 1 wherein said die has first and second sides at least partially defining said interior, said at least one pin extending from said first side to said second side so as to traverse said interior of said die.
4. (original) An apparatus according to Claim 1 further comprising a plurality of rotatable pins extending at least partially into said interior of said die, each of said plurality of pins being structured to stir the workpiece as the workpiece moves through said interior of said die.
5. (original) An apparatus according to Claim 4 further comprising a rotatable turret, said plurality of pins being rotatably mounted to said turret, and wherein said turret is structured to individually rotate each of said plurality of pins in corresponding first directions and to collectively rotate said plurality of pins in a second direction.

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6. (original) An apparatus according to Claim 5 wherein said corresponding first directions are the same as said second direction.

7. (original) An apparatus according to Claim 5 wherein said corresponding first directions are opposite to said second direction.

8. (original) An apparatus according to Claim 5 wherein said corresponding first directions comprise rotating at least two of said plurality of pins in opposite directions.

9. (original) An apparatus according to Claim 1 wherein said interior of said die defines a chamber adjacent said second aperture, said chamber being structured to consolidate the workpiece.

10. (original) An apparatus according to Claim 9 wherein said at least one rotatable pin extends into said interior between said first aperture and said chamber.

11. (original) An apparatus according to Claim 1 wherein said interior of said die is structured to shape the workpiece into a configuration selected from the group consisting of a square, a rectangle and a cylinder.

12. (currently amended) An apparatus for operating on a workpiece, comprising:
at least one motor having a rotatable spindle;
a die defining first and second apertures and an interior extending therebetween, said interior of said die being structured to form the workpiece; and
at least one pin in rotatable communication with said spindle, said at least one pin extending at least partially into said interior of said die, said at least one pin being structured to at least partially plasticize the workpiece through frictional heat and to mix the workpiece as the workpiece moves through said interior to thereby refine the grain structure of the workpiece.

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13. (original) An apparatus according to Claim 12 further comprising a ram structured to urge the workpiece through said interior of said die from said first aperture to said second aperture.

14. (original) An apparatus according to Claim 12 wherein said die has first and second sides at least partially defining said interior, said at least one pin extending from said first side to said second side so as to traverse said interior of said die.

15. (original) An apparatus according to Claim 12 further comprising:
a plurality of motors each having a rotatable spindle; and
a plurality of pins each being in rotatable communication with a corresponding one of said spindles, each of said plurality of pins extending at least partially into said interior of said die, said plurality of pins being structured to at least partially mix the workpiece as the workpiece moves through said interior of said die to thereby refine the grain structure of the workpiece.

16. (original) An apparatus according to Claim 12 further comprising:
a rotatable turret, said turret being in rotatable communication with said spindle of said at least one motor; and
a plurality of pins each being in rotatable communication with said turret, each of said plurality of pins extending at least partially into said interior of said die, said turret being structured to individually rotate each of said plurality of pins in corresponding first directions and to collectively rotate said plurality of pins in a second direction, and wherein said plurality of pins are structured to at least partially mix the workpiece as the workpiece moves through said interior of said die to thereby refine the grain structure of the workpiece.

17. (original) An apparatus according to Claim 16 wherein said corresponding first directions are the same as said second direction.

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18. (original) An apparatus according to Claim 16 wherein said corresponding first directions are opposite to said second direction.

19. (original) An apparatus according to Claim 16 wherein said corresponding first directions comprise rotating at least two of said plurality of pins in opposite directions.

20. (original) An apparatus according to Claim 12 wherein said interior of said die is structured to shape the workpiece into a configuration selected from the group consisting of a square, a rectangle and a cylinder.